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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,849	10/03/2003	Yukihisa Takeuchi	791_229	2431

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EXAMINER	
DOUGHERTY, THOMAS M	
ART UNIT	**PAPER NUMBER**
2834	

DATE MAILED: 02/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/678,849	**Applicant(s)** TAKEUCHI ET AL.
	Examiner Thomas M. Dougherty	**Art Unit** 2834

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-11,13-15,17-19 and 24-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *17-19* is/are allowed.

6)☒ Claim(s) *1,2,4-7,11,13-15 and 24-26* is/are rejected.

7)☒ Claim(s) *8-10* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments, see paper, filed 1/6/06, with respect to the claims have been fully considered and are persuasive regarding the axial line and the description of Kogyo's elements not being pillar-shaped. The rejection of 10/12/05 has been withdrawn. The discussion of whether or not Kogyo discloses a matrix however is disputed. Kogyo's matrix is simply a 1 x 6 matrix. Note that in his claims the applicant requires two pillar elements, thereby defining a 1x2 matrix.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 4-7, 13, 14 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kogyo (JP 2000-25241) in view of Baba et al. (JP 2000-337882).

Kogyo shows (fig. 10) a less-dust-generative piezoelectric/electrostrictive device comprising: a ceramic substrate (1), see paragraph 13 of the translation; and a piezoelectric/electrostrictive element (3) which is set up on the ceramic substrate (1) and which includes a piezoelectric/electrostrictive member (3) and at least one pair of electrodes (8) formed on side surfaces of the piezoelectric/electrostrictive member (3) and which is integrally formed with the ceramic substrate (1), wherein the side surfaces of the piezoelectric/electrostrictive member on which the electrodes are formed are fired, but unprocessed faces. Note that firing is inherent. Note that Kogyo shows the use of forming the piezoelectric/electrostrictive actuator by the method of using a mold, which is the same as that used by the Applicants at page 10, paragraph 21 of the disclosure. As such, the goal of the invention, that being "a less-dust-generative" device is regarded as being met, though Kogyo doesn't specifically mention that goal. Note also that generally, the method of forming a device is not germane to the issue of patentability of the device itself. In re Brown 173 USPQ 685, In re Fessman 180 USPQ 324.

Regarding claim 5, Kogyo shows a distance between at least one pair of electrodes (8) formed on side surfaces of the piezoelectric/electrostrictive member constituting the piezoelectric/electrostrictive element is 300 micrometers or less in a transverse surface of the piezoelectric/electrostrictive element having the pillar shape. See paragraph 18 of the translated detailed description where it is noted that the resist material "is mostly formed in the thickness about 200 micrometers, corresponding to the height of a septum 3." Note that the distance between each septum (3) is less than the height, therefore it is clear that the requirement of 300 micrometers or less in a transverse surface is met.

The ceramic substrate (1) is thick, the piezoelectric/electrostrictive element (3) has a wall shape, and a plurality of piezoelectric/electrostrictive elements (3) are set up in a matrix form on the ceramic substrate (1) to form the less-dust-generative piezoelectric/electrostrictive device of a matrix type.

The straightness of an axial line of the piezoelectric/electrostrictive element having the pillar shape is about 30 micrometers or less. By sight, an axial line of each pillar-shaped element appears perfectly straight.

The piezoelectric/electrostrictive element (3) has a thin-wall shape, and two or more piezoelectric/electrostrictive elements (3) are set up like comb teeth (see fig. 1) on the ceramic substrate (1), and the device comprises a cell including: the ceramic substrate (1); one piezoelectric/electrostrictive element (3); the other piezoelectric/electrostrictive element (3) disposed adjacent to the one piezoelectric/electdrostrictive element; and a lid section (4) for connecting the one piezoelectric/electrostrictive element (3) to the other piezoelectric/electrostrictive element (3) to form the less-dust-generative piezoelectric/electrostrictive device of a cell driving type.

An aspect ratio of the piezoelectric/electrostrictive element having the thin wall shape is in a range of about 2 to 40, determinable by sight in figure 1.

Kogyo further shows a plurality of cells (3) each of which is formed independently of the adjacent cell (3), wherein a ratio of a distance between one cell (3) and another cell (3) disposed adjacent to said one cell (3) to a height of the piezoelectric/electrostrictive element is in a range of about 1:2 to 1:100. This is determinable by sight.

The side surfaces of the piezoelectric/electrostrictive device (11) on which the electrodes (8) are formed have a homogeneous surface.

Kogyo doesn't show a pillar shape.

Kogyo doesn't explicitly state an aspect ratio for his piezoelectric/electrostrictive element which has the shape of a pillar in a range of about 20 to 400. Figure 1 does show a significant aspect ratio however. It is not clear that a ratio of a distance between one piezoelectric/electrostrictive element and the other piezoelectric/electrostrictive element disposed adjacent to the piezoelectric/electrostrictive element to a height of one piezoelectric/electrostrictive element is in a range of about 1:20 to 1:400.

Baba et al. shows (fig. 1) a less-dust-generative piezoelectric/electrostrictive device comprising: a ceramic substrate (12), see Solution part of the translation; and a piezoelectric/electrostrictive element (11) which is set up on the ceramic substrate (12) and which includes a piezoelectric/electrostrictive member (11) and at least one pair of electrodes (A, B) formed on side surfaces of the piezoelectric/electrostrictive member (11) and which is integrally formed with the ceramic substrate (12).

The ceramic substrate (12) is thick, the piezoelectric/electrostrictive element (11) has a wall shape, and a plurality of piezoelectric/electrostrictive elements (11a-c) are set up in a matrix form (a 1x3 matrix) on the ceramic substrate (12).

The straightness of an axial line of the piezoelectric/electrostrictive element (11) having the pillar shape is about 30 micrometers or less. By sight, an axial line of each pillar-shaped element (11a-c) appears perfectly straight.

The piezoelectric/electrostrictive element (11) has a thin-wall shape, and two or more piezoelectric/electrostrictive elements (11a-c) are set up like comb teeth (see fig. 1) on the ceramic substrate (12), and the device comprises a cell including: the ceramic substrate (1); one piezoelectric/electrostrictive element (11); the other piezoelectric/electrostrictive element (11) disposed adjacent to the one piezoelectric/electrostrictive element (11).

An aspect ratio of the piezoelectric/electrostrictive element (11) having the thin wall shape is in a range of about 2 to 40, determinable by sight in figure 1.

Baba et al. further show a plurality of cells (11a-c) each of which is formed independently of the adjacent cell, wherein a ratio of a distance between one cell and another cell disposed adjacent to said one cell to a height of the piezoelectric/electrostrictive element (11) is in a range of about 1:2 to 1:100. This is determinable by sight.

The side surfaces of the piezoelectric/electrostrictive device (11) on which the electrodes (8) are formed have a homogeneous surface.

It is not clear whether or not Baba et al. fires his piezoelectric, although since it is ceramic, this is a typical process for the material. Baba doesn't show a lid section.

Baba et al. don't explicitly state an aspect ratio for their piezoelectric/electrostrictive element which has the shape of a pillar in a range of about 20 to 400. Figure 1 does show a significant aspect ratio however. It is not clear that a ratio of a distance between one piezoelectric/electrostrictive element and the other piezoelectric/electrostrictive element disposed adjacent to the piezoelectric/electrostrictive element to a height of one piezoelectric/electrostrictive element is in a range of about 1:20 to 1:400.

It would have been obvious to one having ordinary skill in the art to duplicate the manufacturing method (firing) of Kogyo in the device of Baba et al. at the time of the

Baba et al. invention since it makes the device more efficient and processed accurately as Kogyo notes. It would have further been obvious to one having ordinary skill in the art to provide a lid to the Baba et al. device at the time of their invention to provide protection to the device, which a lid always suggests.

It would have been obvious to one having ordinary skill in the art to employ an aspect ratio of about 20 to 400 for each piezoelectric/electrostrictive pillar in the combined device of Kogyo and Baba et al. and to employ a ratio of a distance between one piezoelectric/electrostrictive element and the other piezoelectric/electrostrictive element disposed adjacent to the piezoelectric/electrostrictive element to a height of one piezoelectric/electrostrictive element is in a range of about 1:20 to 1:400 since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Claims 2, 11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chae (US 5,631,764) in view of the combined invention of Kogyo (JP 2000-25241) and Baba et al. (JP 2000-337882). Given the combined invention of Kogyo and Baba et al. as noted above, it fails to show the piezoelectric/electrostrictive element wired via a through hole or a via hole formed in the ceramic substrate.

Chae shows (fig. 3) a piezoelectric/electrostrictive device comprising: a substrate (1 and 31b), which includes a piezoelectric/electrostrictive member (e.g. 32b) and at least one pair of electrodes (33a, 33b) formed on side surfaces of the piezoelectric/electrostrictive member (32b) and which is integrally formed with the substrate (31b).

Chae shows the piezoelectric/electrostrictive element (32b) wired via a through hole or a via hole (e.g. 11 or 12) formed in the substrate (both 1 and 31b).

Chae further shows his piezoelectric/electrostrictive elements (30, 30', 30") comprising two or more layers of piezoelectric/electrostrictive members (e.g. 32a, 32b); and electrodes (33a, 33b) formed on opposite outer surfaces of the two or more layers of piezoelectric/electrostrictive members (32a, 32b) and between two or more layers of piezoelectric/electrostrictive members, see electrode 36 between the two layers of 32a, 32b.

Chae doesn't disclose his piezoelectric/electrostrictive material nor does he note how his device is made.

It would have been obvious to one having ordinary skill in the art to employ the wiring through a hole of a via hole such as is taught by Chae, in the device of Kogyo at the time that invention was made, in order to limit the possibility of short circuits between electrode leads, in order to keep wiring from being snagged etc. and in order to prevent wiring from becoming disconnected.

Regarding claims 11 and 15, it would have been obvious to one having ordinary skill in the art to use the mold method of Kogyo for forming a piezoelectric/electrostrictive element such as is shown by Chae, since such an element is easy to form as shown by Kogyo.

Allowable Subject Matter

Claim 8-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 17-19 are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Toru (JP 11-132769) shows a ceramic base (10) with piezoelectric/electrostrictive pillars (11-14) extending from it and which have side electrodes (see figs.). A lid (17) covers the ceramic base and pillar configuration.

Direct inquiry to Examiner Dougherty at (571) 272-2022.

tmd
tmd

September 21, 2005

Thomas M. Dougherty
TOM DOUGHERTY
PRIMARY EXAMINER